CHROMOSOME NUMBERS IN THE GENUS

ONCIDIUM

AND ALLIED GENERA

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By

Uthai Charanasri

Thesis Committee:

Haruyuki Kamemoto, Chairman
Richard Hartmann
Yoneo Sagawa

We certify that we have read this thesis and that in our opinion it is satisfactory in scope and quality as a thesis for the degree of Master of Science in Horticulture.

THESIS COMMITTEE

W. H. Gardner

Chairman

Richard W. Hartmann

Yoneo Sagawa

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INTRODUCTION

The Oncidium genus comprises 450 to 750 valid species (Schultes, 1960; Hawkes, 1965). It is large and polymorphic. All of the species in this genus are native of tropical and subtropical America being widely distributed from Florida and Mexico through West Indies and Central America to Argentina. The species exhibit diverse vegetative and floral structures. They inhabit hot sea-level to cool mountainous areas. Some of the genera allied to Oncidium have common habitats and may produce intergeneric hybrids when crossed with Oncidium.

Chromosome numbers of seventy-six Oncidium species and forty-two species in related genera have been recorded to date. The somatic chromosome numbers show a wide range from 10 to 168. The production of successful interspecific and intergeneric Oncidium hybrids appears to be possible among species with different chromosome numbers.

The present study involved chromosome counts of available species in Oncidium and allied genera including Odontoglossum, Gomesa, Miltonia, Rodriguezia, Brassia and Comparettia.

The objective of this investigation was to determine the chromosome numbers of species in Oncidium and allied genera and to correlate variations in number with species relationships.

REVIEW OF LITERATURE

The genus Oncidium Sw. is one of the largest and most complex genera in the Orchidaceae (Correll, 1950; Hawkes, 1965; Schultes, 1960). It comprises members that are epiphytic, terrestrial, or lithophytic. The pseudobulbs are variously shaped and generally conspicuous. The pseudobulb is one, two, or many-leaved, subtended by foliaceous or papery bracts. Some species are pseudobulbless. The leaf is subcoriaceous to fleshy-coriaceous, and equitant, flat, or terete. The inflorescence is simple or branched, and one- or more-flowered. One or several inflorescences are produced laterally from the base of the pseudobulb, or in the nonpseudobulbous species from the leaf axil. The flowers are variable in size from extremely small to large and showy and are usually yellow or brownish but occasionally white, red, or magenta. The floral bract is small. The sepals are subequal, spreading or reflexed, and free. The petals are subequal to or larger than the dorsal sepal. The lip is adnate to the base of the column and usually forms a right angle with the column. The lip is entire or three or more-lobed with the apical lobe usually much larger than the other lobes. The disk of the lip is usually tuberculate or cristate. The column is short, stout, usually with lateral petaloid auricles at the apex, footless or occasionally with an incipient foot. The clinandrium is truncate, entire or apically two-dentate. The capsule is usually beaked, and is ovoid to ellipsoid fusiform. The anther consists of two pollinia.

Dodson (1958) noted that the species were botanically difficult to separate and that a precise generic description was difficult to compile.

The placement of the Oncidium alliance was changed several times by different taxonomists. Bentham and Hooker (1883) placed it in the

the subtribe Oncidieae, tribe Vandeae. Schlechter (1926) divided the Oncidium alliance into many subtribes based on floral and vegetative characteristics of the plants. Dressler and Dodson (1960) proposed a new classification, placing all genera of the alliance in the subtribe Oncidiinae.

The sectional classification of Oncidium attracted the attention of several orchid taxonomists. Lindley (1855) described 209 species of Oncidium and classified the genus into fourteen sections. Pfitzer (1889) arranged Oncidium into seventeen sections and listed seven other related genera. Kränzlin (1922) published a monograph of the genus and classified these species into eighteen sections. Garay (1970), within the framework established by Kränzlin, proposed a reappraisal of the genus Oncidium Sw., incorporating the genus Cyrtochilum and some species of Odontoglossum into the twenty-five sections including all existing type specimens and species described since 1922.

Although the first chromosome count of Oncidium was made by Afzelius in 1916, most of the chromosome counts have been accumulated within the last fourteen years. Afzelius recorded the gametic number of Oncidium praetextum as n = 28. Hoffmann (1929, 1930) published the chromosome numbers of four Oncidium species: O. bicallosum as n = 14, O. varicosum as n = 28, and O. crispum and O. flexuosum as 2n = 56. Eftimiu-Heim (1941) reported the chromosome number of O. excavatum to be 2n = 56. Dodson (1957a, 1957b, 1957c) reported the chromosome numbers of twenty-nine species of Oncidium. Since 1957, several published accounts on Oncidium and its related genera have appeared (Dodson, 1958; Blumenshein, 1960; Sinoto, 1962, 1964; Kugut, 1966; and Sharma and Chatterji, 1966).

Chromosome counts have been recorded to date for eighty species in Oncidium and forty-five species in allied genera. The chromosome numbers reported are 2n = 10, 14, 24, 26, 28, 30, 32, 34, 36, 37, 38, 40, 42, 44, 46, 48, 52, 54, 56, 60, 84, 112, 133, and 168. The majority of species have 56 chromosomes. There are several discrepancies in chromosome numbers as recorded by different investigators.

Dodson (1958) discussed the cytotaxonomy in the subtribe Oncidiinae based on the morphology of nuclei at the interphase stage, chromosome numbers, chromosome morphology, and cell size.

MATERIALS AND METHODS

Plant Material

The species of the genera Oncidium, Miltonia, Odontoglossum, Rodriguezia, Comparettia, Gomesa, and Brassia used in this investigation were available in the collection of the Horticulture Department of the University of Hawaii. Most of the species were obtained from orchid growers in Hawaii and other parts of the United States. The collection consisted of sixty-five species from nine genera in the subtribe Oncidiinae. Among these were 38 Oncidium species representing fourteen sections in Garay's classification (1970) and the remainder in the genera Miltonia, Odontoglossum, Trichopilia, Lockhartia, Rodriguezia, Comparettia, Gomesa, and Brassia. The species used in the present study are listed in Table I and illustrated in Figures 1-62.

Methods

Determinations of somatic chromosome number were made utilizing vigorously growing root tips. Samples were cut approximately 2 mm. long between the hours of 9:00 a.m. and 12:00 noon. These were pretreated in 0.002 M 8-hydroxyquinoline for four hours at 15°C, and fixed in Carnoy (1:1:2) mixture of 95% ethyl alcohol, chloroform, and glacial acetic acid for 20 minutes at 10°C. When immediate squashing was not possible, the root tips were stored at 7°C in 45% acetic acid for up to one week.

In preparation for squashing, the root tip was hydrolyzed with 1 N hydrochloric acid for five minutes at 50°C. It was immediately washed with tap water, and kept in 45% acetic acid for ten minutes. After removing the root cap, the remaining tissue was cut into small pieces

TABLE I. LIST OF SPECIES INVESTIGATED

Genus, Section, and Species	Author	Place of Publication
Oncidium	Sw.	Vet. Akad. Handl. Stockh. 21:239. 1800
Section Cyrtochilum	(H.B.K.) Lindl.	Orch. sub. t. 48. 1842
microchilum	Batem. ex Lindl.	Bot. Reg. 26:82. 1840
Section Cebolletae	Lindl.	Bot. Reg. 28: sub. t. 4. 1842
syn.: Sect. Teretifolia	Lindl.	Bot. Reg. 32: sub. t. 27. 1846
cebolleta	(Jacq)Sw.	K. Vet. Acad. Handl. Stockh. 21:240. 1800
syn.: longifolium	Lindl.	
ottonis	Rchb.f. ex Kzl.	
sprucei	Lindl.	
nudum	Batem.	Bot. Reg. 23: sub. t. 1994. 1837
syn.: ebrachiatum	Ames & Schweinf.	
stipitatum	Lindl.	Bot. Sulphur. 172. 1844
Section Oncidium	(Sw.) Garay	Taxon 19: 448. 1970
syn.: Sect. Equitantia	Lindl.	Paxt. Fl. Gard. 1:24. 1844
Sect. Aphanobulbia-Variegata	Kzl.	Pflanzenr. IV. 50, Heft 80:96. 1922
bahamense	Nash ex Britt. & Millsp.	Bahama Flora 97. 1920
desertorum	Nash ex Withner	Amer. Orch. Soc. Bull. 36:312. 1967
haitiense	Leonard & Ames ex Ames	Orchid 7:159. 1922
henekenii	Schomb. ex Lindl.	Fol. Orch. Oncid. 11. 1855
lucayanum	Nash ex Britt. & Millsp.	Bahama Flora 98. 1920
pulchellum	Hook.	Bot. Mag. t. 2773. 1827
triquetrum	(Sw.) R. Br.	Ait., Hort. Kew. ed. 2. 5:216. 1813
variegatum	Sw.	K. Vet. Akad. Handl. Stockh. 21:240. 1800
var. roseum	Moir & Hawkes	Phytologia 15:2. 1967
Section Miltoniastrum	Rchb. f.	Walp. Ann. Bot. Syst. 3:557. 1852
syn.: Sect. Plurituberculata	Lindl.	Paxt. Fl. Gard. 1: t. 6. 1850
Sect. Aphanobulbia-Miltoniastrum	Kzl.	Pflanzenr. IV. 50, Heft 80:96. 1922

TABLE I. (Continued) LIST OF SPECIES INVESTIGATED

Genus, Section, and Species	Author	Place of Publication
Oncidium (continued)		
bicallosum	Lindl.	Benth. Pl. Hartw. 94. 1842
carthagenense	(Jacq)Sw.	Kongl. Vet. Acad. Nya. Handl. 21:240. 1800
haematochilum (natural hybrid)	Lindl. ex Paxt.	Fl. Gard. 1: t. 6. 1850
lanceanum	Lindl.	Tran. Hort. Soc. Lond. n.s. 2:100. 1836
luridum	Lindl.	Bot. Reg. misc. 63. 1836.
syn.: guttatum	Rchb. f.	Walp. Ann. Bot. Syst. 6:782. 1863
stramineum	Lindl.	Bot. Reg. misc. 63. 1838
Section Crispa	Rchb. f. ex Pfitz.	Eng. & Prantl. Pflanzenr. 2 pt. 6:200. 1889
syn.: Sect. Cruciata-Grandiflora	Kzl.	Pflanzenr. IV. 50. Heft. 80:132. 1922
sarcodes	Lindl.	Hort. Soc. 14:260. 1825
Section Glanduligera	Lindl.	Folia Orch. Oncid. 2. 1855
papilio	Lindl.	Bot. Reg. 2: t. 910. 1825
Section Concoloria	Kzl.	Pflanzenr. IV. 50. Heft 80:206. 1922
syn.: Sect. Integrilabia	Lindl.	Paxt. Fl. Gard. 1:24. 1850
onustum	Lindl.	Gen. & Sp. Orch. 203. 1833
Section Stellata	Kzl.	Pflanzenr. IV. 50. Heft 80:211. 1922
maculata	Lindl.	Sert. Orch. sub. t. 48. 1841
Section Pulvinata	Lindl.	Paxt. Fl. Gard. 1:24. 1850
pulvinatum	Lindl.	Bot. Reg. misc. 115. 1838
Section Oblongata	Kzl.	Pflanzenr. IV. 50. Heft 80:224. 1922
ampliatum	Lindl.	Gen. & Sp. Orch. Pl. 202. 1834
Section Tigrina	Kzl.	Pflanzenr. IV. 50. Heft 80:233. 1922
splendidum	A.Rich. ex Duchartre	Lourn. Soc. Imp. Hort. Paris 50. 1862
tigrinum	Llav. & Lex.	Nov. Veg. Desc. 2: 36. 1825

TABLE I. (Continued) LIST OF SPECIES INVESTIGATED

Genus, Section, and Species	Author	Place of Publication
Oncidium (continued)		
Section Altissima	Kzl.	Pflanzenr. IV. 50. Heft 80:249. 1922
ansiferum	Rchb. f.	Bot. Zeit. 10:696. 1852
baueri	Lindl.	Bauer, Ill. Orch. Gen. t. 7. 1830-38
ensatum	Lindl.	Bot. Reg. 15. 1842
syn.: confusum	Rchb. f.	
floridanum	Ames	Sched. Orch. 7:13. 1924
stenotis	Rchb. f.	Linnaean XLI:67. 1877
Brassia	R. Brown	Hort. Kew., ed. 2, 5:215.
alleni	L. O. Wms. ex C. Schweinf.	Bot. Mus. Leafl. Harv. Univ. 13:145, t. 12. 1948
caudata	(L.) Lindl.	Bot. Reg. 10:t. 832.
gireoudiana	Rchb. f. & Warsc.	Allgem. Gartenz. 23:273. 1854
maculata	R. Br.	Aiton, Hort. Kew. ed. 2, 5:215. 1813
pumila	Linden.	Bot. Reg., 185, Mis. 62.
Comparettia	Poepp. & Endl.	Nov. Gen. ac. Sp. Pl. 1:42, t. 73. 1835
falcata	Poepp. & Endl.	Nov. Gen. ac. Sp. Pl. 1:42, t. 73. 1835
macroplectron	Rchb. f. & Triana	Gard. Chron. 2:524. 1878
Gomesa	R. Brown	Bot. Mag. t. 1748. 1815
crispa	(Lindl.) Klotzsch ex Rchb. f.	Bot. Zeit. 10:772. 1852
Miltonia	Lindl.	Bot. Reg. 1976, et t. 1992.
flavescens	Lindl.	Sertum, Sub t. 48.
roëzlii	(Rchb. f.) Nichol	Bot. Mag. t. 6085.

TABLE I. (Continued) LIST OF SPECIES INVESTIGATED

Genus, Section, and Species	Author	Place of Publication
Odontoglossum	H.B.K.	Nov. Gen. et Sp., 1. 351. LO. p. 211.
cariniferum	Rchb. f.	Bot. Zeit. 10:638. 1852
grande	Lindl.	Bot. Reg. 26:misc. p.47. 1840
stenoglossum	(Schltr.) L.O. Wms.	Lloydia 10:212. 1947
Rodriguezia	Ruiz & Pavon	Fl. Peruv. & Chil. Prodr. 115, t. 25. 1794
venusta	(Lindl.) Rchb. f.	Man. Orch. Pl. 9:176. 1893

PLATE I. VEGETATIVE AND FLORAL CHARACTERISTICS OF ONCIDIUM SPECIES.

Figure

1 O. lanceanum (0.1X).

2 O. bicallosum (0.25X).

3 O. bicallosum (1.0X).

4 O. luridum (0.1X).

5 O. stramineum (0.12X).

6 O. stramineum (1.8X).

7 O. luridum (1.6X).

8 O. carthagenense (1.8X).

9 O. carthagenense (0.1).


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PLATE II. VEGETATIVE AND FLORAL CHARACTERISTICS OF ONCIDIUM SPECIES.

Figure

10 O. microchilum (0.1X).

11 O. microchilum (1.7X).

12 O. splendidum (0.1X).

13 O. splendidum (1.2X).

14 O. cebolleta (0.2X).

15 O. cebolleta (1.7X).

16 O. nudum (2.0X).

17 O. stipitatum (0.12X).

18 O. stipitatum (1.7X).

19. O. nudum (0.12X).

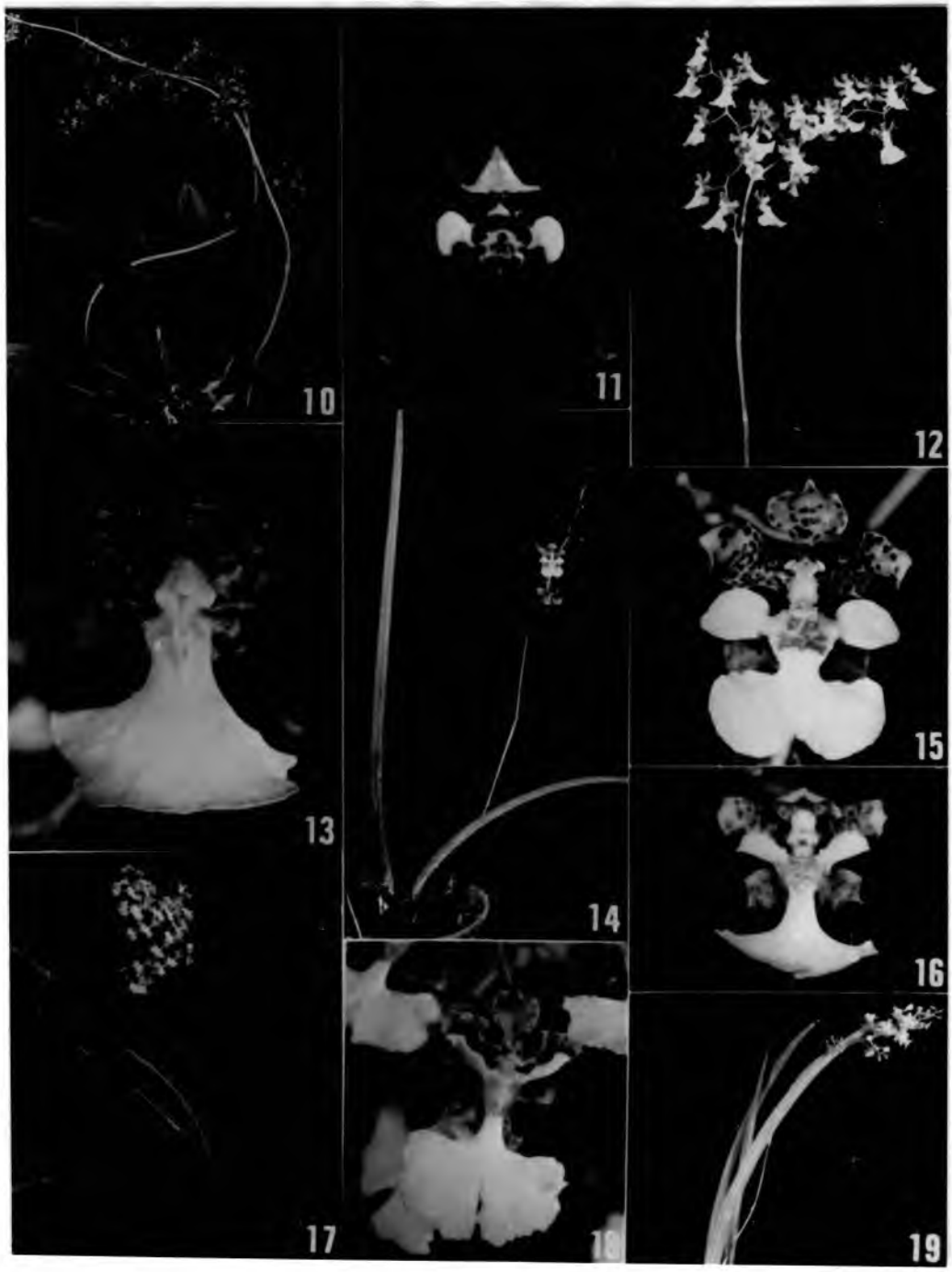
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PLATE III. VEGETATIVE AND FLORAL CHARACTERISTICS OF ONCIDIUM SPECIES.

Figure	
20	O. desertorum (1.0X).
21	O. desertorum (0.3X).
22	O. lucayanum (1.5X).
23	O. lucayanum (0.3X).
24	O. bahamense (0.8X).
25	O. bahamense (0.25X).
26	O. pulchellum (0.1X).
27	O. haitiense (0.2X).
28	O. haitiense (1.7X).
29	O. pulchellum (1.0X).
30	O. variegatum (1.2X).
31	O. variegatum (0.15X).

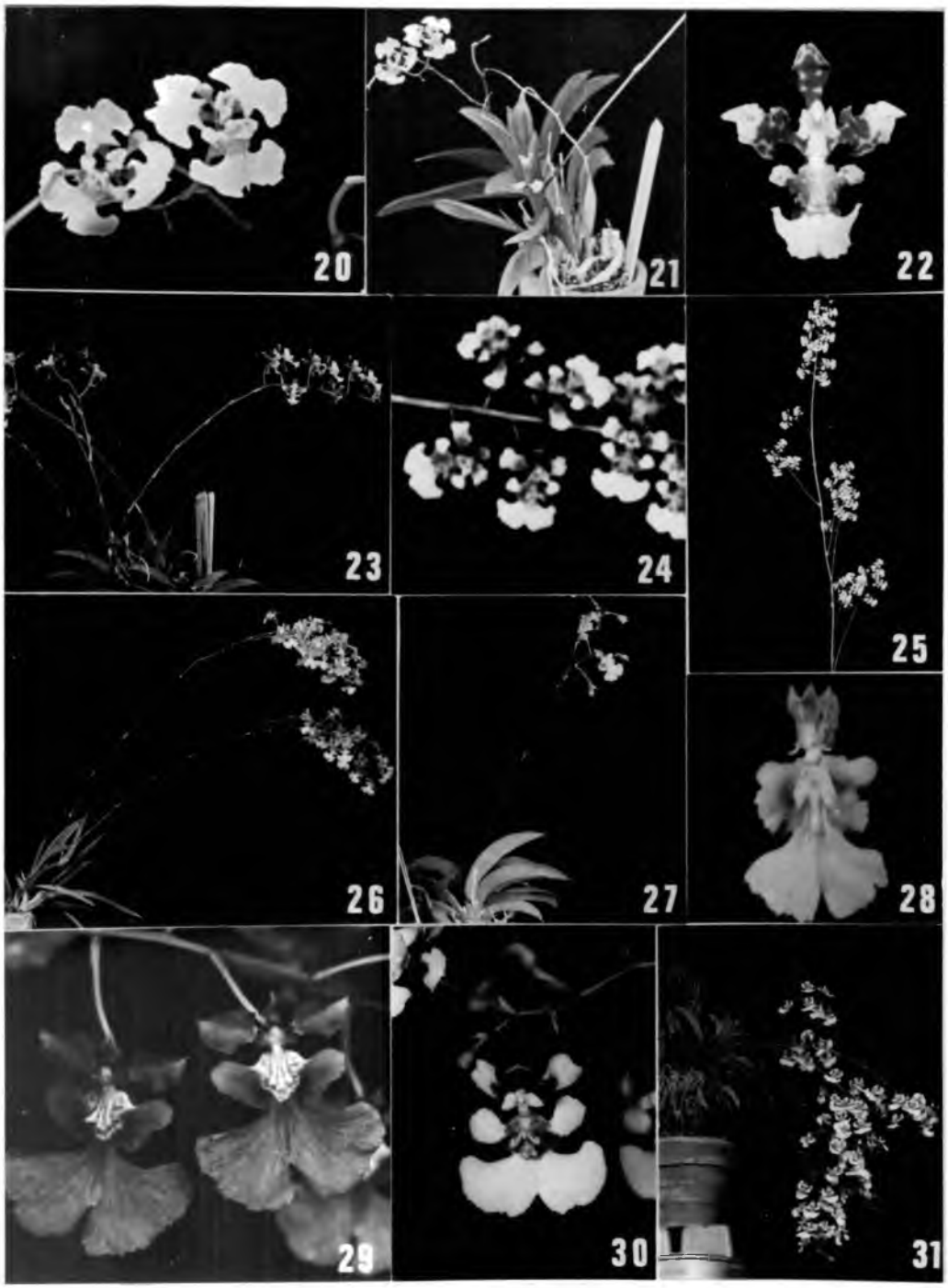
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PLATE IV. VEGETATIVE AND FLORAL CHARACTERISTICS OF ONCIDIUM SPECIES.

Figure

32 O. triquetrum (0.3X).

33 O. triquetrum (2.0X).

34 O. henekenii (2.0X).

35 O. pulvinatum (0.2X).

36 O. pulvinatum (1.0X).

37 O. papilio (0.6X).

38 O. papilio (0.1X).

39 O. ampliatum (0.2X).

40 O. ampliatum (1.5X).

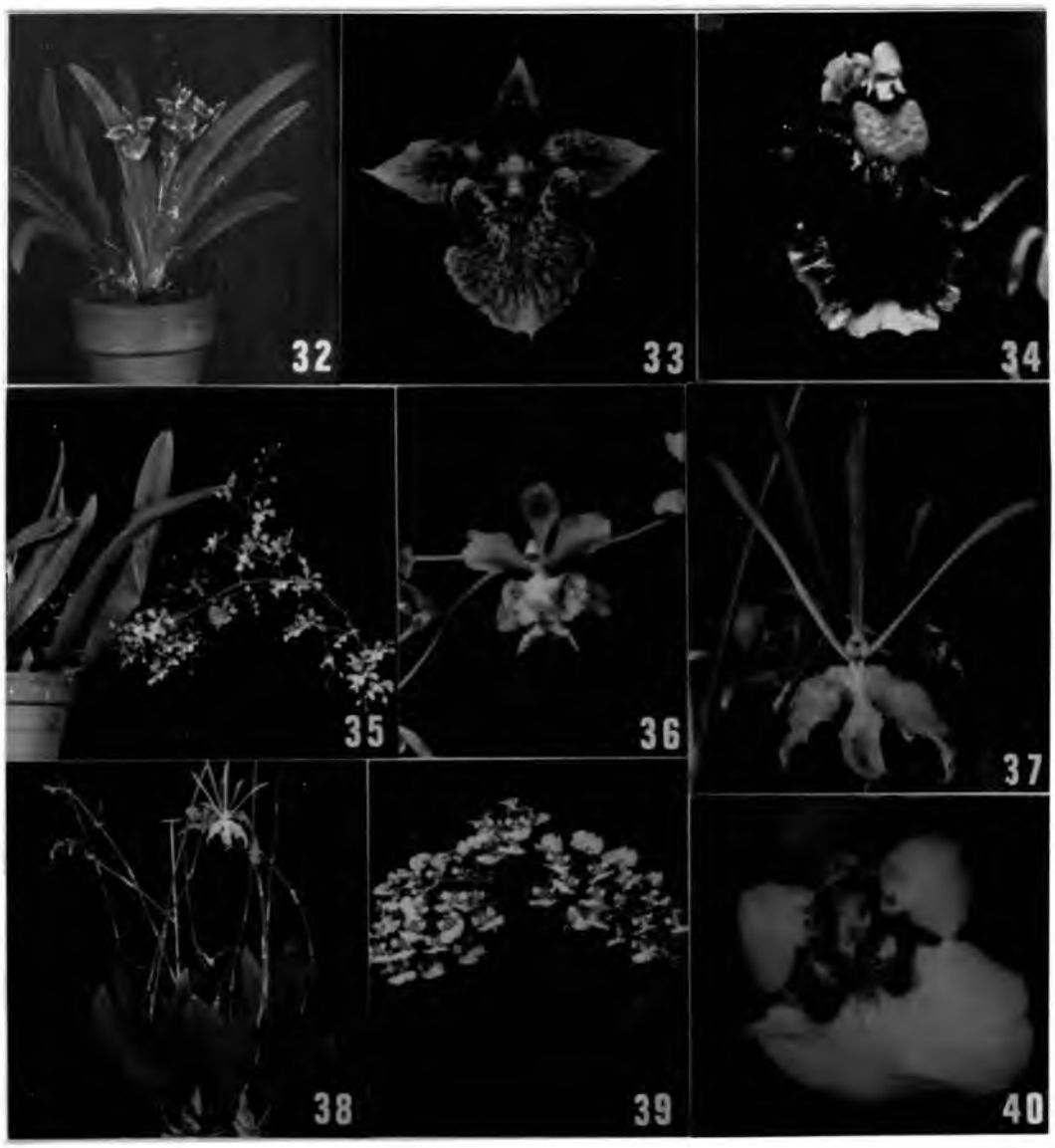
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PLATE V. VEGETATIVE AND FLORAL CHARACTERISTICS OF ONCIDIUM SPECIES.

Figure

41 O. maculatum (1.0X).

42 O. maculatum (0.15X).

43 O. tigrinum (0.2X).

44 O. tigrinum (1.0X).

45 O. onustum (0.2X).

46 O. onustum (2.0X).

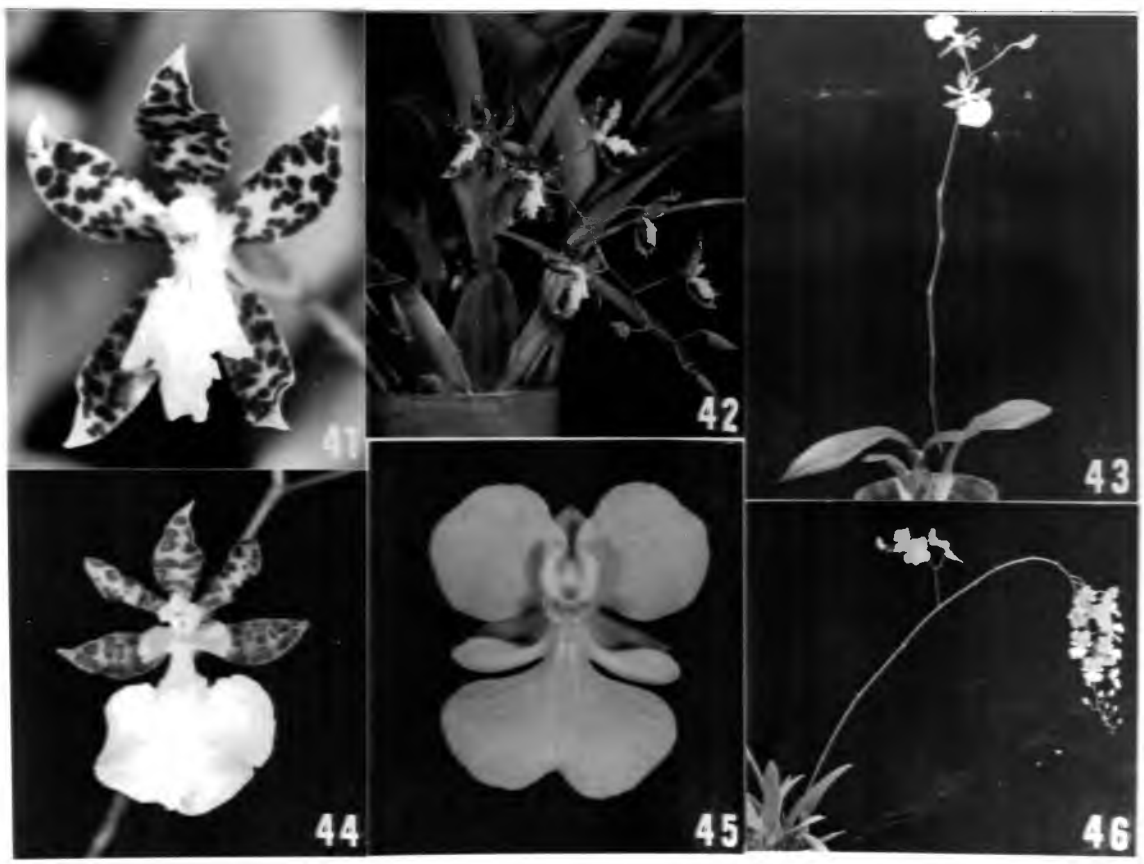
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PLATE VI. VEGETATIVE AND FLORAL CHARACTERISTICS OF ONCIDIUM SPECIES.

Figure

47 O. ensatum (0.27X).

48 O. ensatum (1.6X).

49 O. ansiferum (2.0X).

50 O. ansiferum (0.1X).

51 O. floridanum (0.07X).

52 O. floridanum (1.5X).

53 O. baueri (0.05X).

54 O. sarcodes (0.1X).

55 O. sarcodes (1.5X).

56 O. baueri (1.5X).

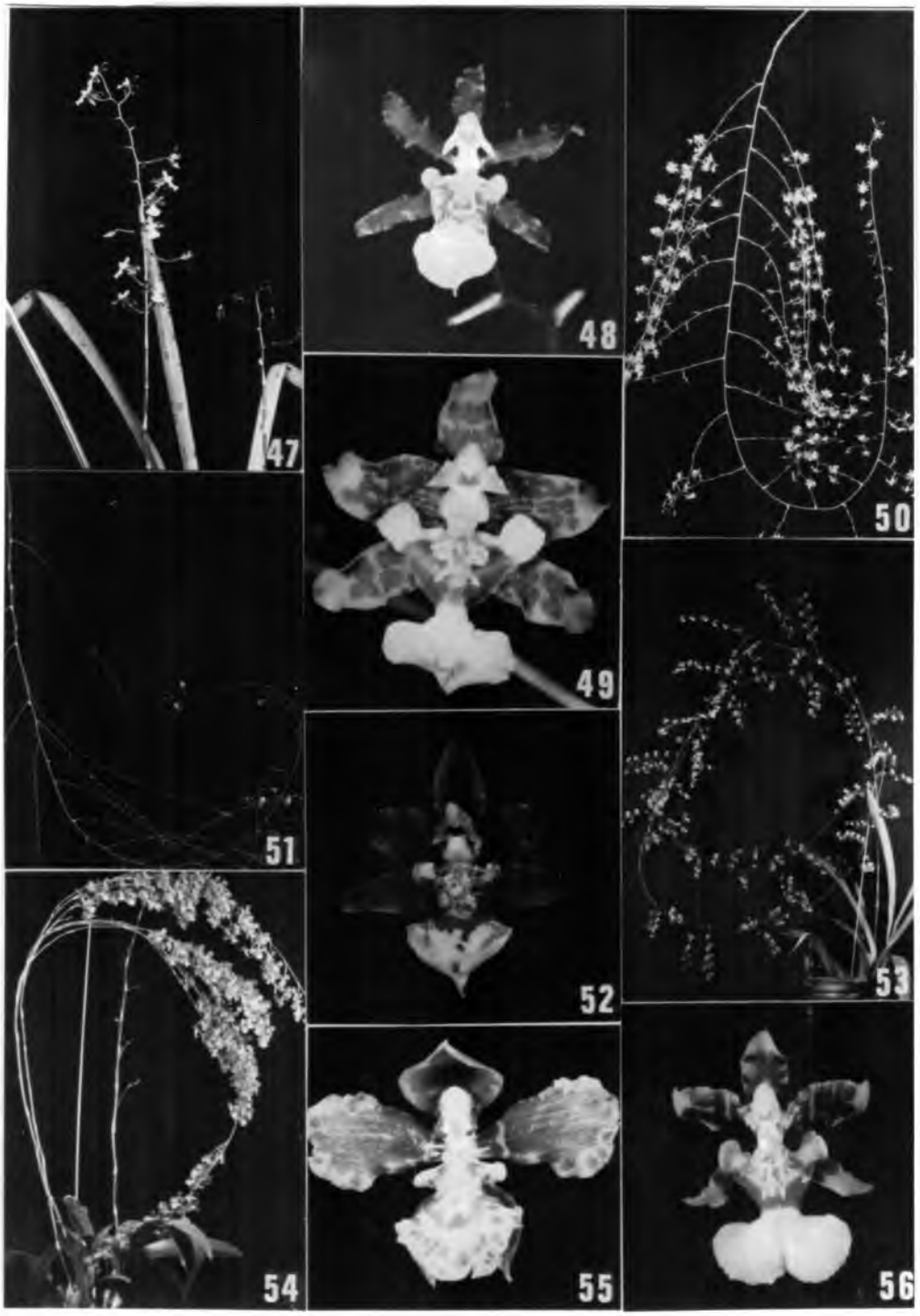
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PLATE VII. VEGETATIVE AND FLORAL CHARACTERISTICS OF SPECIES IN GENERA RELATED TO ONCIDIUM.

Figure

57 Odontoglossum cariniferum (1.5X).

58 Odontoglossum cariniferum (0.2X).

59 Odontoglossum grande (0.6X).

60 Odontoglossum grande (0.1X).

61 Miltonia flavescens (0.25X).

62 Brassia maculata (0.25X).


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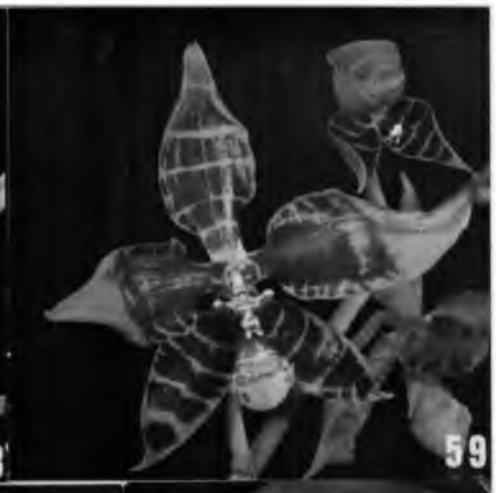
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with dissecting needles under a dissecting microscope. A drop of 1% aceto-orcein was added onto the tissue. The slide was then placed for ten minutes in a glass chamber saturated with 45% acetic acid. The slide was removed from the container, and a cover slip was added. Air bubbles and excess stain were removed by applying pressure on the cover slip after the slide was heated gently. The cover slip was sealed with sticky dental wax.

The preparation was examined under a microscope, and the chromosome number was determined under 100X oil objective. Photomicrographs of selected mitotic metaphase stages were taken at a magnification of 550X with a camera mounted on the microscope.

Color slides and black-and-white photographs were taken of most species involved in this research and placed on file in the Department of Horticulture. Due to the value of the plants it was not possible to prepare herbarium specimens of the plants investigated.

RESULTS AND DISCUSSION

The chromosome numbers of forty-four species representing seven genera based on van der Pijl and Dodson's (1966) classification of the subtribe Oncidiinae were determined by microscopic examination (Tables II and III; Figures 63-99). Of the thirty-one species of the genus Oncidium representing twelve of Garay's (1970) twenty-five sections investigated, the chromosome numbers of the following four species are reported for the first time. O. haitiense 2n = 40 (Fig. 78), O. pulvinatum 2n = 42 (Fig. 83), O. ensatum 2n = 56 (Fig. 92), and O. floridanum 2n = 56 (Fig. 90).

Oncidium lanceanum had the lowest somatic chromosome number with 2n = 26 (Fig. 63), while O. bahamense had the highest with 2n = 84 (Fig. 82).

Three different chromosome numbers were observed in the section Miltoniastrum: 2n = 26, 28, and 30. Chromosome counts reported by various workers for species of this section are not in agreement. Previous workers reported 2n = 28 and 30 for O. carthagenense, 2n = 26 and 28 for O. lanceanum, 2n = 28 and 32 for O. luridum and 2n = 28 and 30 for O. stramineum. The present investigation revealed 2n = 30 (Fig. 66), 2n = 26 (Fig. 63), 2n = 30 (Fig. 67), and 2n = 30 (Fig. 68) for the respective species. The other two species of this section, O. bicallosum (Fig. 65) and O. haematochilum (Fig. 64), were found to be 2n = 28.

A diploid number of 36 was determined for two plants of O. microchilum of the section Cyrtochilum. A third plant of the same species showed 2n = 37, which is apparently a trisomic. The same counts were also recorded by Sinoto (1962).

TABLE II. CHROMOSOME NUMBERS OF ONCIDIUM SPECIES INVESTIGATED

Section and species	Previous counts 2n	n	Authority	Present count 2n	No. of plants counted
Cyrtochilum					
microchilum	36,37		Sinoto '62	36	2
	36		Dodson '57	37	1
Cebolletae					
cebolleta	34		Sinoto '62	36	1
	28		Dodson '57	72	1
	36		Blumenschein '60		
nudum	28		Dodson '57	36	2
stipitatum	28,29		Dodson '57	36	4
Oncidium					
bahamense	84		Reported as O. 'miami' by Sinoto '62	84	4
desertorum	40		Sinoto '62	40	2
	40		Kugut '66		
haitiense				40	1
henekenii	40		Sinoto '62	40	1
lucayanum	40		Reported as O. sp. from Bahama by Sinoto '62	40	2
pulchellum	42		Dodson '58	42	1
	42		Sinoto '62		
	42		Kugut '66		
triquetrum	42		Dodson '58	42	3
	42		Sinoto '62		
variegatum	42		Dodson '58	42	1
	40		Sinoto '62		
var. roseum				42	1
Miltoniastrum					
bicallosum		14	Hoffmann '30	28	1
	28		Dodson '57		
carthagenense	28		Dodson '57	30	1
	30		Sinoto '62		
	30		Kugut '66		
haematochilum	28,40		Sinoto '62	28	2
lanceanum	28		Dodson '57	26	4
	28		Sinoto '62		
	26	13	Sharma & Chatterji '66		
luridum	28		Dodson '57	30	3
	32		Sinoto '62		
	28		Sharma & Chatterji '66		

TABLE II. (Continued) CHROMOSOME NUMBERS OF ONCIDIUM SPECIES INVESTIGATED

Section and species	Previous counts 2n	n	Authority	Present count 2n	No. of plants counted
stramineum	28		Sinoto '62	30	1
	30		Kugut '66		
Crispa					
sarcodes	56		Dodson '57	56	1
Glanduligera					
papilio	38		Dodson '57	38	2
	38		Sinoto '62		
Concoloria					
onustum	56		Sinoto '62	56	2
Stellata					
maculata	56		Sinoto '62	56	1
Pulvinata					
pulvinatum				42	1
Oblongata					
ampliatum	44		Dodson '57	44	4
	44		Sinoto '62		
Tigrina					
splendidum	34		Dodson '57	36	2
	36		Sinoto '62		
tigrinum	54		Kugut '66	56	1
	56		Dodson '58		
Altissima					
ansiferum	56		Sinoto '62	56	1
baueri	52ca.		Dodson '57	56	1
	56		Sinoto '62		
ensatum				56	1
floridanum				56	1
stenotis	56		Sinoto '62	56	1

TABLE III. CHROMOSOME NUMBERS OF SPECIES IN SOME GENERA RELATED TO ONCIDIUM INVESTIGATED

Genus and species	Previous counts 2n	Authority	Present count 2n	No. of plants counted
Brassia				
allenii			50	2
caudata	60	Sinoto '62	60	1
gireoudiana	60	Sinoto '62	60	1
maculata	60	Sinoto '62	60	2
pumila			60	1
Comparettia				
falcata	42	Sinoto '62	44	1
macroplecton			44	1
Gomesa				
crispa			56	1
Miltonia				
flavescens	60	Sinoto '62	60	2
Odontoglossum				
cariniferum			56	1
grande	60?	Sinoto '62	44	1
	44	Dodson '58		
stenoglossum			56	1
Rodriguezia				
venusta	42	Sinoto '62	42	2

PLATE VIII. SOMATIC CHROMOSOMES OF ONCIDIUM SPECIES (1650X). WITH SEPARATED SATELLITES INDICATED BY ARROWS.

Figure

63 O. lanceanum (2n = 26).

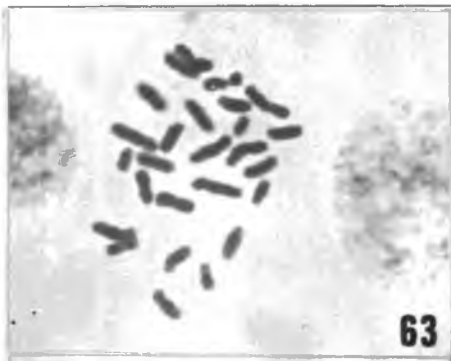
64 O. haematochilum (2n = 28).

65 O. bicallosum (2n = 28).

66 O. carthagenense (2n = 30).

67 O. luridum (2n = 30).

68 O. stramineum (2n = 30).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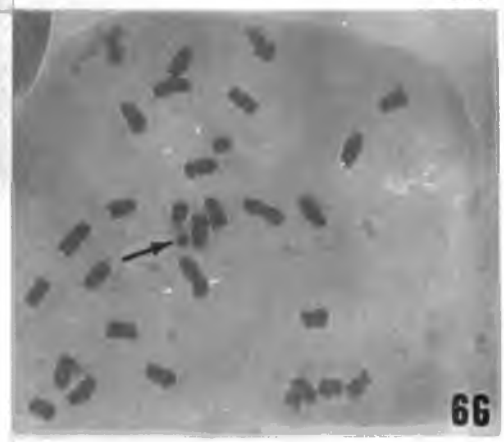
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PLATE IX. SOMATIC CHROMOSOMES OF ONCIDIUM SPECIES (1650X).

Figure

69 O. stipitatum (2n = 36).

70 O. nudum (2n = 36).

71 O. cebolleta (tetraploid form 2n = 72).

72 O. microchilum (2n = 36).

73 O. splendidum (2n = 36).

74 O. papilio (2n = 38).

75 O. papilio 'Latour's' selfed (2n = 38).

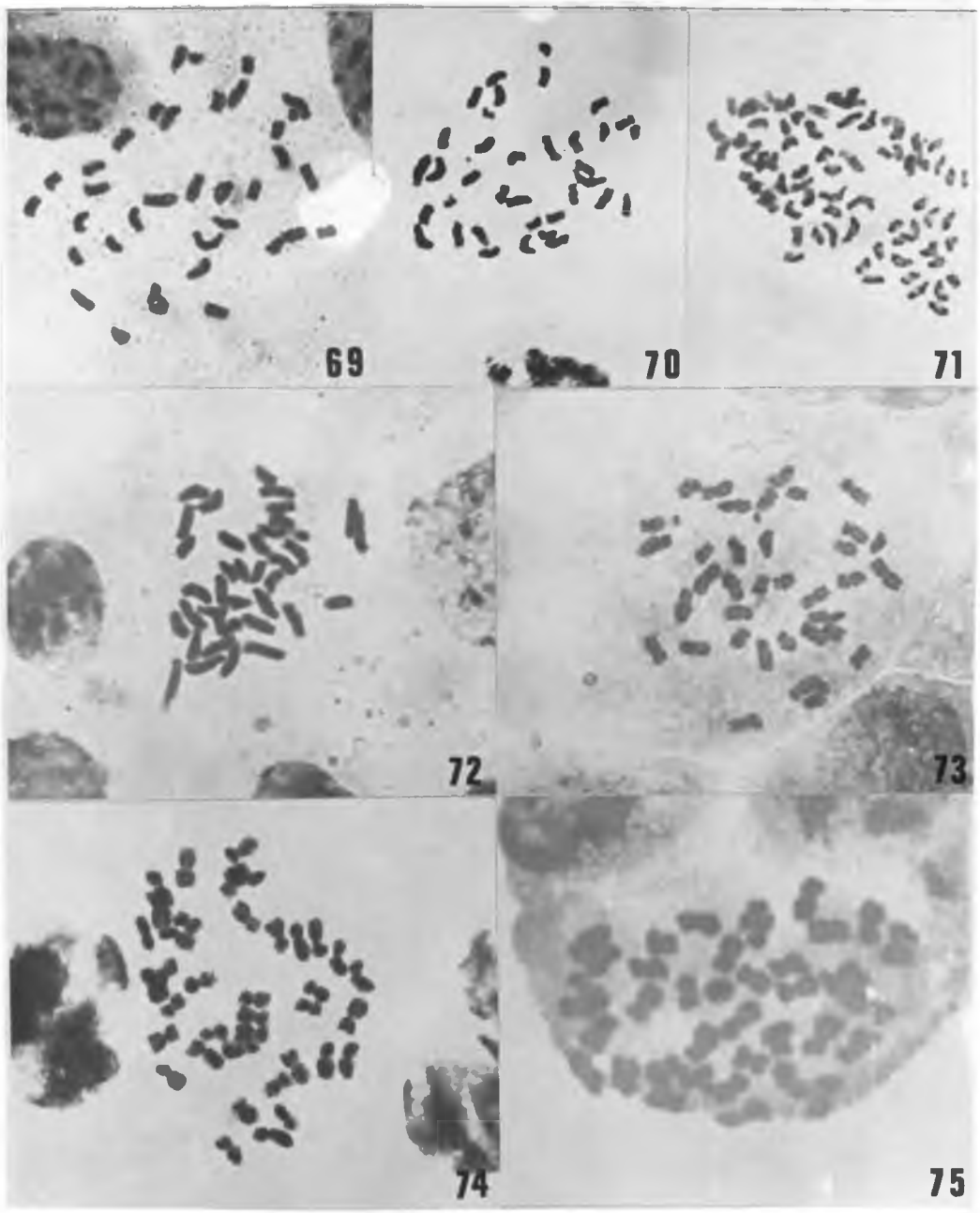
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PLATE X. SOMATIC CHROMOSOMES OF ONCIDIUM SPECIES (1650X).

Figure

76 O. desertorum (2n = 40).

77 O. henekenii (2n = 40).

78 O. haitiense (2n = 40).

79 O. pulchellum (2n = 42).

80 O. triquetrum (2n = 42).

81 O. variegatum (2n = 42).

82 O. bahamense (2n = 84).

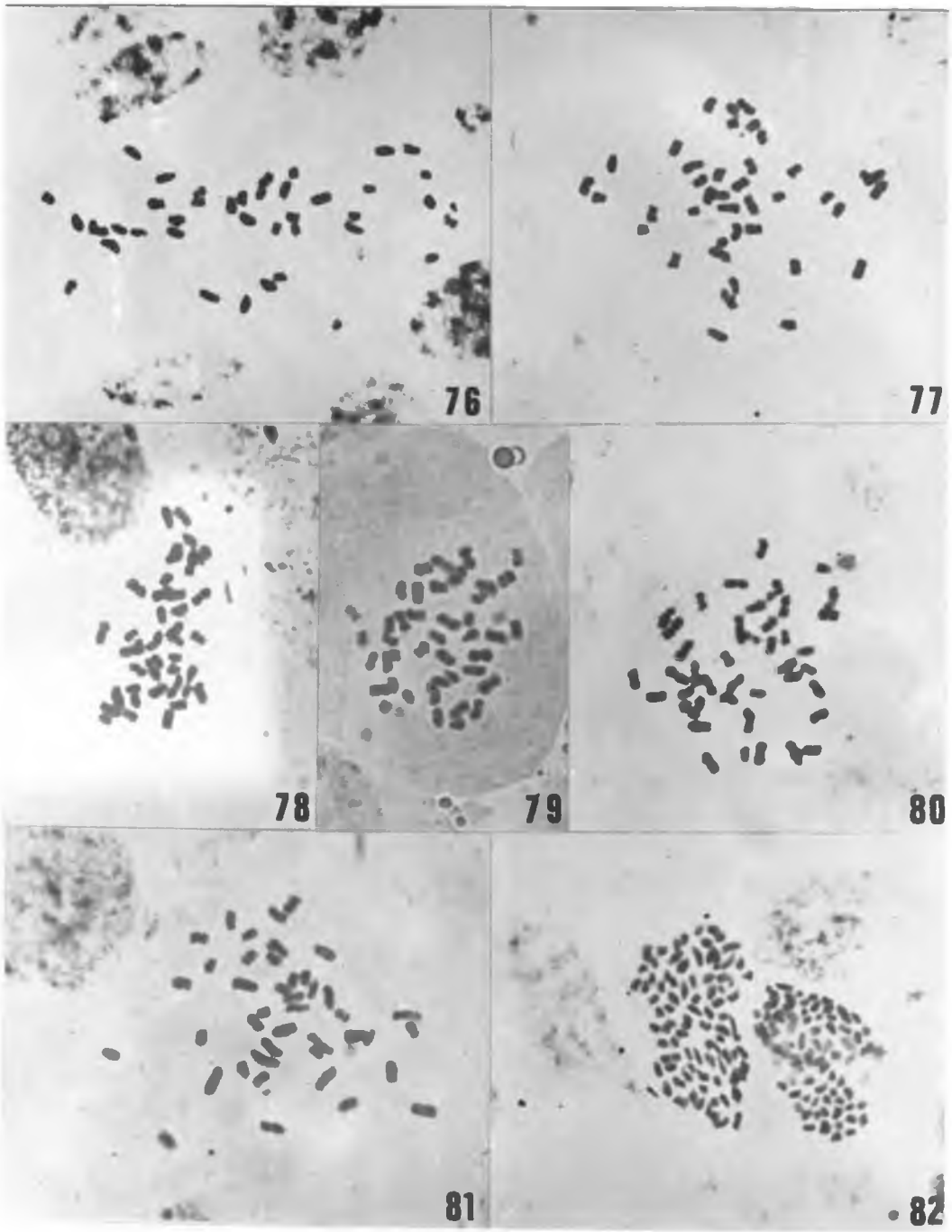
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PLATE XI. SOMATIC CHROMOSOMES OF ONCIDIUM SPECIES (1650X).

Figure

83 O. pulvinatum (2n = 42).

84 O. ampliatum (2n = 44).

85 O. baueri (2n = 56).

86 O. onustum (2n = 56).

87 O. maculatum (2n = 56).

88 O. ansiferum (2n = 56).

89 O. sarcodes (2n = 56).

90 O. floridanum (2n = 56).

91 O. stenotis (2n = 56).

92 O. ensatum (2n = 56).

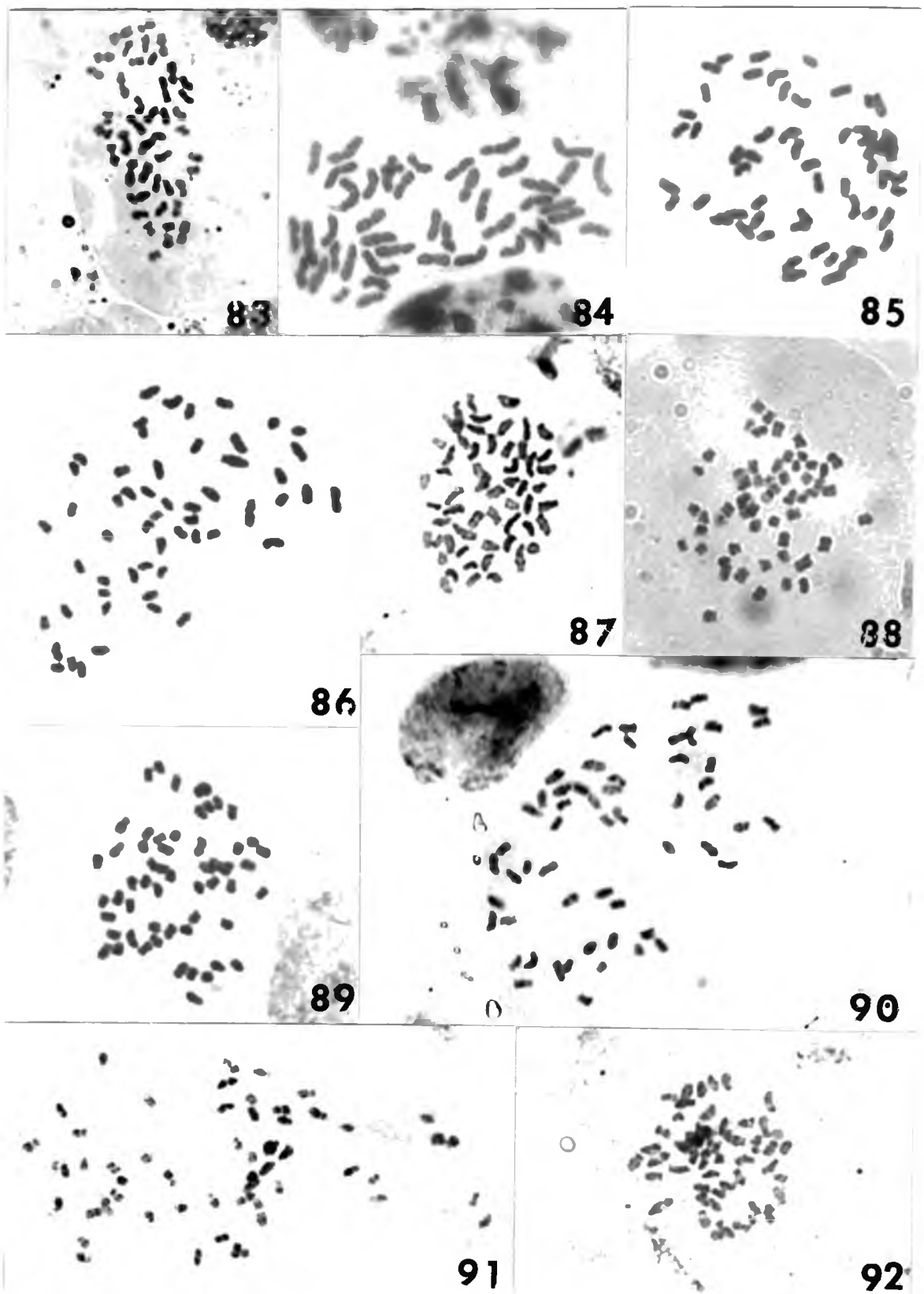
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PLATE XII. SOMATIC CHROMOSOMES OF SPECIES IN SOME GENERA RELATED TO ONCIDIUM (1650X).

Figure

93 Rodriguezia venusta (2n = 42).

94 Odontoglossum grande (2n = 44).

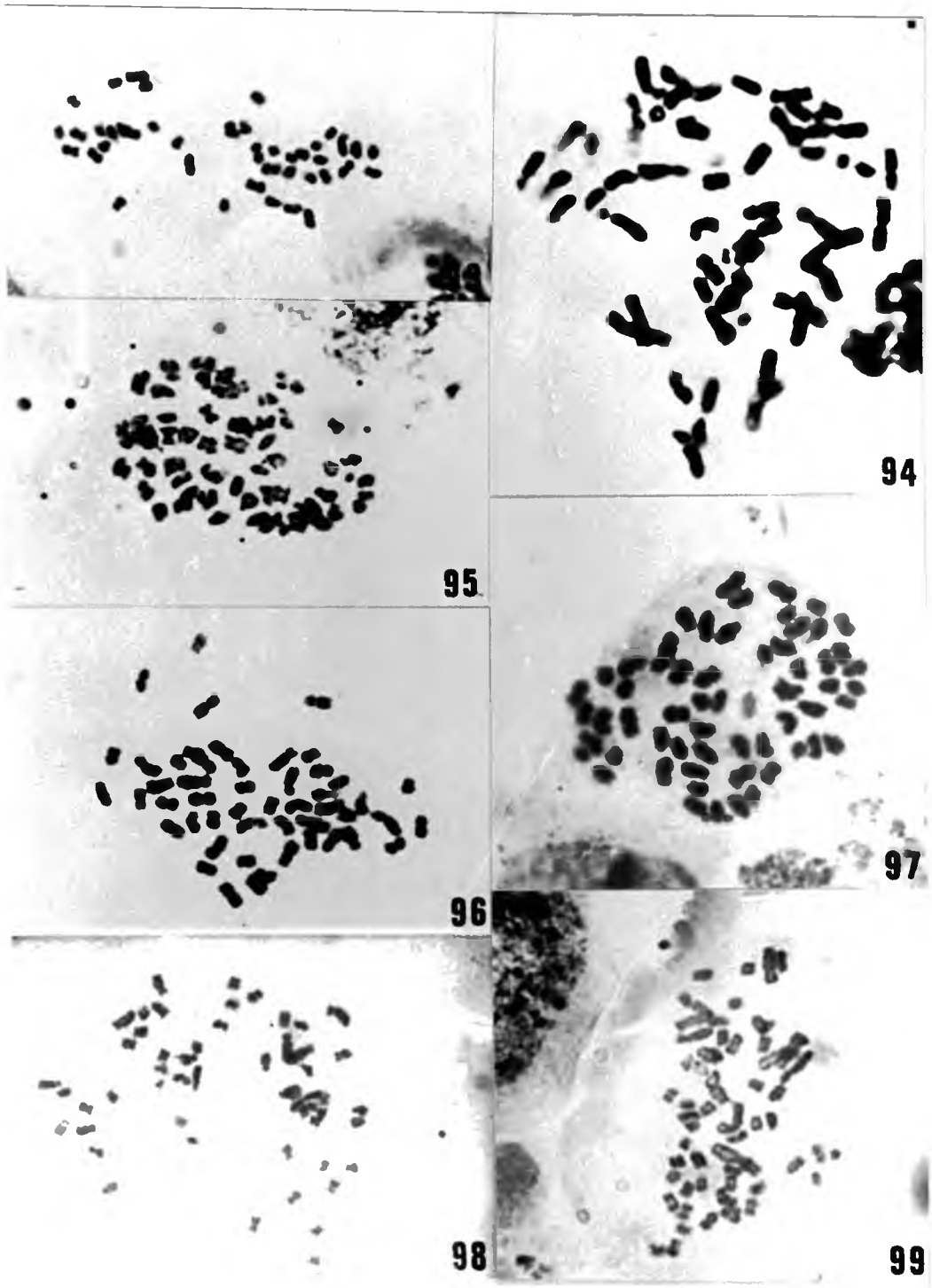
95 Odontoglossum cariniferum (2n = 56).

96 Brassia allenii (2n = 50).

97 Brassia gireoudiana (2n = 60).

98 Gomesa crispa (2n = 56).

99 Miltonia flavescens (2n = 60).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O. splendidum in the section Tigrina had 2n = 36 (Fig. 73) while O. tigrinum, the type species of this section had 2n = 56.

Species in the section Cebolletae had 2n = 36 chromosomes (Figs. 69 and 70). Also a tetraploid form of O. cebolleta with 2n = 72 (Fig. 71) was observed. Both O. nudum and O. stipitatum, like the diploid form of O. cebolleta, exhibited 2n = 36 chromosomes. Previous reports (Blumenschein, 1960; Dodson, 1957; Sinoto, 1962) of chromosome numbers for this group show considerable variation.

The somatic chromosome number 2n = 38 was found in O. papilio in the section Glanduligera both in the present and previous counts.

Three chromosome numbers, 2n = 40, 2n = 42, and 2n = 84 were observed in the section Oncidium. These are in agreement with earlier reports. The chromosome number of O. variegatum was reported as 2n = 40 by Sinoto (1962) and by Dodson (1958). The present investigation revealed 2n = 42.

O. pulvinatum in the section Pulvinata was found to have 2n = 42 chromosomes. The same number was previously reported for O. harrisonianum, another species of the same section by Sinoto (1962).

O. ampliatum in the section Oblongata had 2n = 44 chromosomes.

Members of the sections Crispa, Concoloria, Stellata, and Altissima showed exclusively 2n = 56 chromosomes. These observations are in agreement with earlier reports except for O. baueri of the section Altissima which was reported as 2n = ca. 52 by Dodson (1957c).

The differences in chromosome numbers recorded by various workers may have resulted either through mis-identification of species or through misinterpretation of chromosome configurations. Both chromosomes with large satellites and those with two constrictions are present in the

chromosome complements of species in the Miltoniastrum section. The satellite bodies are loosely attached and often are separated due to the pressure applied in the squashing process. These pieces would be interpreted as separate chromosomes. A determination of chromosome number based on a cell having poorly spread chromosomes at metaphase might easily cause a misinterpretation. For example, two overlapping one-constrictioned chromosomes might be mistaken for a large two-constrictioned chromosome or vice versa. Thus a species with 2n = 28 can be interpreted as 2n = 26, 28, or 30. Critical karyotype analyses would result in a more accurate representation of chromosome numbers of species.

Deviations in somatic chromosome numbers within species might occur because natural interspecific hybrids (Moir, 1970) and introgression (Anderson and Dodson, 1958) are common in the genus Oncidium.

The chromosome numbers of 13 species from six genera related to Oncidium were determined (Table 3; Figures 93-99). Six of these have not been reported previously. They are: Comparettia macroplectron (2n = 44), Brassia allenii (2n = 50; Fig. 96), Brassia pumila (2n = 60), Gomesa crispa (2n = 56; Fig. 98), Odontoglossum cariniferum (2n = 56); Fig. 95), and Odontoglossum stenoglossum (2n = 56). The chromosome numbers of the other seven species are in agreement with previous reports except for Comparettia falcata which was determined as 2n = 44 in contrast to Sinoto's (1962) 2n = 42.

Brassia allenii, a pseudobulbless species, has 2n = 50 while the other species with pseudobulbs in the same genus have 2n = 60.

The basic chromosome number in the subtribe Oncidiinae has not been established. Dodson (1957c, 1958) proposed 7 as the basic number for Oncidium. The number 2n = 10 in O. pusillum might be the result of stepwise reduction or decrease of the chromosome number from 2n = 14. The numbers 2n = 28 (4X) and 56 (8X) were suggested as polyploids, 2n = 42 (6X) as a result of crossing between the two groups, and all the other intermediate numbers between 28 and 56 as fixed aneuploid derivatives. Sinoto (1962) suggested both n = 5 and n = 7 as basic haploid numbers. These two numbers are based in part on 2n = 10 for O. pusillum, the lowest chromosome number encountered in orchids and 2n = 14 for O. glossomystax. A basic number of 5 can explain the occurrence of such numbers as 2n = 40, 50, and 60. On the other hand the basic number of 7 probably can account for most of chromosome numbers of species in the Oncidium alliance. The largest number of species have 2n = 56, a polyploid number (8X) in the X = 7 series. Other euploid numbers which occur are 2n = 14 (2X), 28 (4X), and 42 (6X). The variable numbers in the Miltoniastrum section can conceivably have resulted through reduction and increase from the number 2n = 28 to give rise to 2n = 26 and 30 respectively. Also the 36 chromosome group might have resulted through misdivision or chromosome breakages from the 28 or 30 chromosome species. Additionally hybridization among species with different chromosome numbers may give rise to aneuploid series. Detailed karyotype analyses of species in the 28 to 44 chromosome group and analyses of species hybrids should throw considerable light on the basic number and evolution in Oncidium and allied genera.

SUMMARY

The chromosome numbers of forty-four species in seven genera of the Oncidium alliance were determined: Oncidium: 2n = 26, 28, 30, 36, 38, 40, 42, 44, 56, 72, and 84; Odontoglossum: 2n = 44 and 56; Miltonia: 2n = 60; Gomesa: 2n = 56; Rodriguezia: 2n = 42; Comparettia: 2n = 44; Brassia: 2n = 50 and 60. The chromosome numbers of ten of these species were reported for the first time: Oncidium haitiense: 2n = 40; O. pulvinatum: 2n = 42; O. ensatum: 2n = 56; O. floridanum: 2n = 56; Comparettia macroplectron: 2n = 44; Brassia allenii: 2n = 50; B. pumila: 2n = 60; Gomesa crispa: 2n = 56; Odontoglossum cariniferum: 2n = 56; and O. stenoglossum: 2n = 56.

The cytological evidence indicates that the six related genera investigated cannot be separated from the genus Oncidium on the basis of chromosome numbers.

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